IMPROVING THE CLINICAL MEASUREMENT OF HEMOGLOBIN A1c (HbA1c)
http://www.missouri.edu/~diabetes/ngsp.html

Description of Project

- Goal
  The correlation between HbA1c and risk-associated outcomes demonstrated in the Diabetes Control and Complications Trial (DCCT) and the United Kingdom Prospective Diabetes Study (UKPDS) underscores the need to measure HbA1c with sufficient reliability such that clinical laboratory results can be directly related to these studies and, therefore, to the risk for development or progression of diabetes-related chronic complications. A lack of comparability of HbA1c test results among methods and laboratories is a major obstacle to the effective implementation of a national and global strategy to reduce the complications associated with diabetes through proper glycemic control. The goal of this project is to improve HbA1c measurements and data interpretation across clinical systems and national harmonization projects.
- Approach
  This goal will be accomplished by: (1) providing continuous technical support and assistance to the National Glycohemoglobin Standardization Program (NGSP) and the International Federation of Clinical Chemistry (IFCC) programs to improve and maintain standardized HbA1c laboratory measurements over time; and (2) conducting research on issues that can affect HbA1c measurement and data interpretation.

Accomplishments

- Supported the efforts of the NGSP technically and financially by providing direct funding of the administrative core and laboratory infrastructure of the NGSP for Fiscal Years 2000, 2001, 2002, 2003 and 2004.
- During the period April 2002 through March 2003, the NGSP certified or recertified 59 manufacturer methods and 43 laboratory methods.
- Participated as a member of the NCCLS Subcommittee on Glycohemoglobin Measurements to prepare an NCCLS practice guideline, C44A – "Harmonization of Glycohemoglobin Measurements." This guideline includes information on the rationale for harmonization of HbA1c testing results and the process and clinical application of harmonized HbA1c measurements in managing patients with diabetes (please see http://www.nccls.org/free/c44-a.pdf)
- Improved HbA1c measurements internationally by:
  - Participating as a member of the International Federation for Clinical Chemistry (IFCC) Working Group on HbA1c Standardization to develop, validate and optimize an international reference method for HbA1c measurement.
  - Participating in two interlaboratory comparisons in FY 2004 as the only U.S. laboratory in the IFCC Reference Laboratory Network for HbA1c.

    - Participated in the successful establishment and implementation of a master equation that allows the conversion of data among the different standardization efforts.
- Participation in a collaborative study to assess the impact of hemoglobin variants on HbA1c measurements in clinical analyzers.
- Assisted the College of American Pathologists (CAP) develop and implement a fresh-specimen proficiency testing program to evaluate performance of laboratories measuring HbA1c. Provided target testing of samples used in the CAP proficiency testing survey.
- Publications
    - Hoelzel W, Weykamp C, Jeppsson JO, Miedema K, Barr JR, Goodall I, Hoshino T, John WG, Kobold U, Little R, Mosca A, Mauri P, Paroni R, Susanto F, Takei I, Thienpont L, Umemoto M, Wiedmeyer HM. IFCC reference system for measurement of hemoglobin A1c in human blood and the national standardization schemes in the United States, Japan, and Sweden: A method-comparison study. Clin. Chem., Jan 2004; 50: 166 - 174.
    - Jeppsson JO, Kobold U, Barr J, Finke A, Hoelzel W, Hoshino T, Miedema K, Mosca A, Mauri P, Paroni R, Thienpont L, Umemoto M, Weykamp C. Approved IFCC reference method for the measurement of HbA1c in human blood. Clin Chem Lab Med 2002; 40(1):78–89.
    - Goldstein DE, Chenault VM, Durban WJ, Eckfeld JH, Hill JG, Messenger LJ, Myers GL, Vorberg E. Harmonization of Glycohemoglobin Measurements; Approved Guideline. NCCLS document C44. ISBN 1-56238-421-X.
    - Ospina M, Woolfitt AR, Wu W, Vesper H, Barr JR, Myers G. Comparison of an ESI-LC/MS reference method for biomarkers of diabetes on two quadrupole mass spectrometers. Poster Session Presentation, annual conference of the American Society for Mass Spectrometry, June 2002.

Future directions

- Increase comparability of results nationally through technical and financial support of the NGSP.
- Assure transferability of results internationally through participation in calibrator characterization studies on an international level twice a year.
- Complete the collaborative study on the impact of hemoglobin variants on HbA1c measurements.
- Further investigate the impact of hemoglobin variants on glycation and define its clinical relevance.
- Assess the relationship between blood glucose values and HbA1c formation on a molecular level.

Participants

Sponsor: Centers for Disease Control and Prevention